young Britons—English, Scotch, and Irish—to be maintained at universities in the United States?"

THE Lord Mayor of Liverpool, Mr. W. Watson Rutherford, has received in his capacity of chairman of the university committee the charter of the new University of Liverpool. Since the publication of the first draft of the charter, a clause has been added specifying that degrees representing proficiency in subjects of technology shall not be conferred without proper security for testing the scientific and literary knowledge underlying technical considerations. Mr. Rutherford has addressed a letter to the Liverpool City Council suggesting that the new university "be directly allied with the city, and should be free," and the letter is to be considered by the council as we go to press. In his letter Mr. Rutherford says:—"Let the matriculation examination be as severe as any in the country, and let every degree remain as high a standard of knowledge as that of any university in the world; but let there be no fees, no financial barrier whatever to the poorest citizens of Liverpool obtaining all the advantages of the Liverpool University," and he goes on to point out that a maximum rate of one penny in the pound would cover the students' fees and leave a considerable margin. The letter maintains that another benefit would be a sense of proprietary interest in the university on the part of the citizens of all classes in Liverpool, who would thereby at this juncture have not only elementary, secondary, and technical instruction, but the highest regions of advanced education, placed at their free disposal, and would, therefore, be far more likely to take a keener interest in the Liverpool University. The objections that what is not paid for is not valued, and that the course proposed would discourage private munificence, are regarded by Mr. Rutherford as ill-founded. The experiment of conducting a free university in this country has not yet been tried, and should the proposal be put into practice, the results will be awaited with keen interest by all who desire the spread of higher education. At the first meeting of the council of the university held on Tuesday, Lord Derby, the Chancellor, pledged himself to the utmost of his power to help to lay the foundations of a university in which studies of the arts, science, and other subjects should receive all possible expansion. Mr. E. K. Muspratt was appointed president, and Mr. J. W. Alsop vice-president, of the university council.

THE Board of Education has published "Syllabuses and Lists of Apparatus Applicable to Schools and Classes other than Elementary" for next session, that of 1903–4. The divisions in science and art subjects other than mathematics, formerly described as Elementary Stage and Advanced Stage, are now described as Stage 1 and Stage 2, and the divisions in science subjects, formerly known as Honours Part i. and Honours Part ii., are now described as Stage 3 and Honours. We notice that the examination tables supplied to mathematical candidates have been revised, and that notice is given that the alternative Stage 1 of theoretical inorganic chemistry will probably be discontinued after next session's work. Section i. of the first stage of the hygiene syllabus has been transferred to the subjects in which the Board of Education does not hold examinations. The second part of the volume is wholly devoted to two sets of syllabuses, styled concise and detailed respectively, in a great variety of subjects suitable for evening continuation schools, but in which the Board does not hold examinations.

NEW buildings, for which the sum of 80,000*l.* is required, will shortly be erected for University College, Reading. Of this amount, 30,000*l.* has already been contributed by five donors, including 10,000*l.* given by Mr. G. W. Palmer, M.P., and 10,000*l.* by Lady Wantage. The late Lord Wantage was president of the college from 1896 to 1901.

THE "Year-book" of the Armour Institute of Technology at Chicago for the session 1903–1904 contains not only full particulars of the courses in mechanical, electrical, civil, and chemical engineering, as well as in architecture, at the College of Engineering, but also of the preliminary studies which have been arranged at the Armour Scientific Academy, where students are prepared for the more advanced work of the college. Taking into their own hands in this way the early training of their engineering students, the authorities of the Armour Institute are able to provide the professors with students possessing a sufficiently good education to benefit by the lectures.

THE issue of *Science* for June 19 reprints Prof. R. H. Thurston's address at the dedication of Engineering Hall, Iowa State College. The subject chosen is the functions of technical science in education for business and the professions, and in the course of the address Prof. Thurston pleads powerfully for the full recognition of the importance of scientific knowledge to men whose business is in any way connected with technical matters. Perhaps the part of the address which will most interest the English reader is that which deals with the employment of American students after they have left the universities or colleges. The demand for college-trained men seems to be much greater in America than it is here, the "captains of industry" in that country having apparently realised the value of sound theoretical training in those whom they put in charge of their technical manufactures. "I have a deep file of letters calling for such men," says Prof. Thurston. "There is practically none unemployed unless on the sick list. All the professional engineering schools are thus situated. Turning out a thousand or more annually, the whole output is absorbed by the great industries, and immediately upon leaving the doors of the college." Can English professors say the same?

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 28.—"On a Remarkable Effect produced by the Momentary Relief of Great Pressure." By J. Y. **Buchanan**, F.R.S.

The experiment was made first during the cruise of the *Challenger* on March 27, 1873, in lat. 21° 26′ N., long. 65° 16′ W., where the depth of the sea was 2800 fathoms, and it was repeated on board the yacht *Princesse Alice* (H.S.H. the Prince of Monaco) on March 11, 1902, in lat. 43° 8′ N., long. 19° 48′ W., where the depth of the sea was 3000 fathoms.

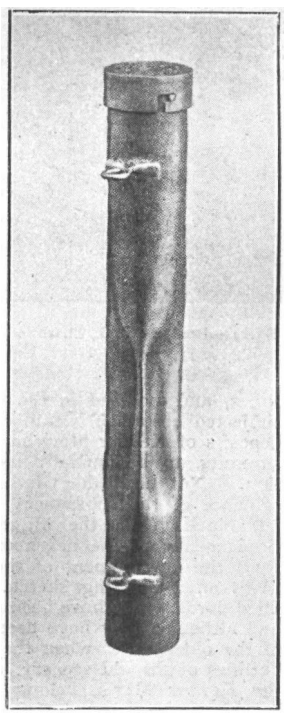

FIG. 1.

Fig. 1 shows the effect produced on a stout brass tube 13 inches long and 1⅜ inches in diameter, which was perfectly cylindrical before it was exposed to the momentary relief of high pressure which has produced so deep a corrugation. In Fig. 2 the corresponding effect on a copper sphere of 5 inches diameter is shown; it takes the form of a multitude of small creases in place of the single deep corrugation produced on the tube. The experiments were made on the sounding cord on board the yacht *Princesse Alice* on September 10 and 11, 1902. The brass tube contained an ordinary 50 c.c. pipette sealed up at both ends, and empty except for the air which it contained. It occupied the part of the tube which has been so disfigured, and was kept in its place by a loose packing of cotton waste. Water had free access both at top and bottom.

The copper sphere contained a small spherical glass flask of 1 to 1½ inches in diameter, and it was kept more or less in the centre of the sphere by loose cotton packing; small holes at each pole of the sphere admitted the outer water. The brass tube was attached to the sounding cord and sent

to a depth of 3000 metres. The copper sphere was sent first to 3000 metres, but with no effect, and then to about 6000 metres, when the effect shown in Fig. 2 was produced. The *rationale* of the proceeding is:—at some depth less than 3000 metres in the case of the brass tube, and less than 6000 metres in the case of the copper sphere, the glass tube in the former and the glass sphere in the latter case collapsed suddenly. Considering, for brevity's sake, only the brass tube; immediately before the collapse the pressure inside and outside the brass tube was equal and uniform. The collapse of the glass tube produced a sudden and very considerable relief of pressure inside the brass tube. In ordinary circumstances the void so produced would have been filled by water from the outside entering through the perforated ends of the tube. But as the glass tube was subjected to a pressure of nearly 300 atmospheres before it collapsed, the difference of pressure produced in a moment of time was between 200 and 300 atmospheres. The deep corrugation shown in Fig. 1 proves that it was easier *in the time* for the pressure to pinch up the stout brass tube than to shove in the plugs of water at either end. The sudden action of the pressure is due, not to the settling of the column of 2000 to 3000 metres of water on the tube, but to the resilience of the enormous quantity of water of high tension produced by the pressure under which it finds itself.

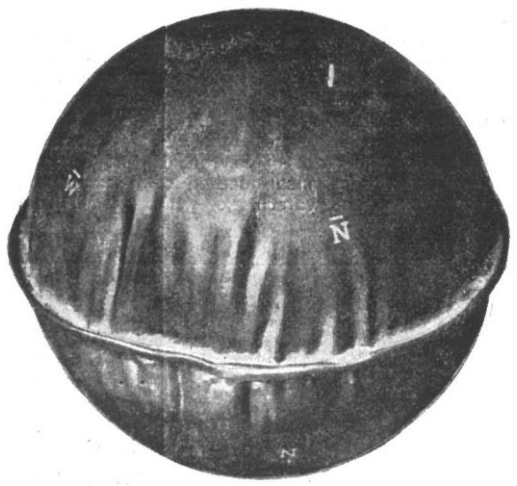

FIG. 2

The effect produced on the copper sphere when the enclosed glass sphere collapsed is of exactly the same kind.

The experiment was originally made on board the *Challenger* on the day after she made her deepest sounding in the Atlantic in the neighbourhood of the West India Islands. On that occasion both the thermometers attached to the sounding line collapsed under the enormous pressure of 3875 fathoms, amounting to 700 atmospheres, and the experiment was made with tubes of three different widths in water of 2800 fathoms in order to obtain data for the construction of future thermometers. Two of the tubes collapsed, only the narrowest, having a diameter of 6 millimetres, withstood both the pressure assisted by the shock of the others collapsing near it. In all three cases the glass tubes were converted into a fine powder like snow.

The collapse of the brass tube, in the peculiar circumstances of the experiment, is the exact counterpart of the experiment which is frequently, but unintentionally, made by people out shooting, especially in winter. If, from inattention or other cause, the muzzle of the gun gets stopped with a plug of even the lightest snow, the gun, if fired with this plug in its muzzle, invariably bursts. Light as the plug of snow is, it requires a definite time for a finite pressure, however great, to get it under way. During this short time the tension of the powder gases becomes so great that the barrel of the ordinary fowling-piece is unable to withstand it and bursts.

June 18.—"New Investigations into the Reduction Phenomena of Animals and Plants." Preliminary Communication. By Prof. J. B. **Farmer**, F.R.S., and J. E. S. **Moore.**

In this communication the authors in the first place pointed out that the attention which investigators have recently paid to reduction phenomena occurring in animals

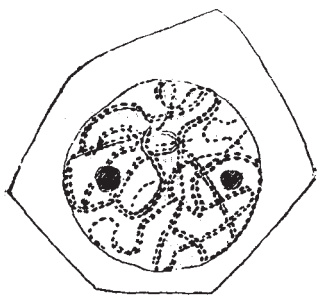

Fig. 1.

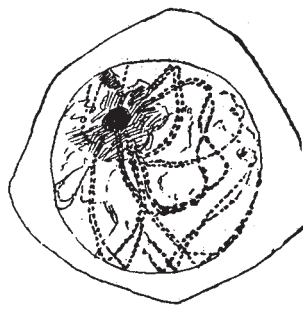

Fig. 2.

and plants has resulted so far in an increasing divergence of opinion, both respecting the nature of this process and its significance. At the same time it was, however, apparent that there were several important points upon which all were now agreed; it had, for example, been clearly shown that, during this process, the number of the chromosomes occurring in the cells affected was reduced by one-half, and that this reduction was brought about during the rest preceding two cell divisions, which appeared to be invariably related to the process. Consequently it was rendered probable that the explanation of reduction was to be sought through a minute study of this, the synaptic rest phase, in a number of selected animals and plants. With this object, the authors had made a close examination of a large number of types, including mammals, elasmobranchs, amphibia and insects among animals, phanerogams, ferns and liverworts among plants, and the results of this investigation are at variance with the common existing conceptions of the process, while at the same time they seem to indicate a possible reconciliation between the different views which have been, and still are, held by other investigators. It will be remembered that there are two main theories of reduction. In the first we have the process regarded as a qualitative division of the chromatin by the separation into daughter nuclei of entire somatic chromosomes.

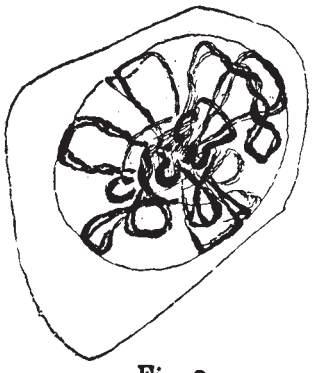

Fig. 3.

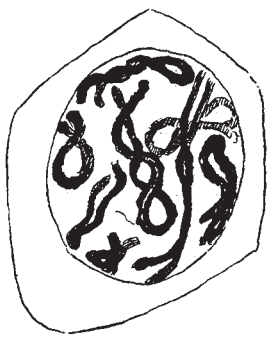

Fig. 4.

In the second, the identity of the original somatic chromosomes becomes lost during the synaptic rest, and these are then replaced by half the number of new ones, which, during their formation, become longitudinally split twice in planes at right angles to each other. This double longitudinal division serves for two mitoses which take place almost simultaneously.

The authors find that at the end of the synaptic rest

the spirem thread certainly undergoes longitudinal fission. Connected with this there is a stage when the thread is arranged in loops, the split sides of which are approximated together in U-shaped figures. Although at their first formation the sides of these U-shaped loops are far apart, and still show the original longitudinal fission, they ultimately become approximated together, and at the same time the original fission, running throughout the length of the loops, disappears from general view. Through this process the approximated sides of the loops have hitherto been generally mistaken for the thickened halves of the originally split spirem thread, whereas in favourable cases it is seen that this fission can still be traced running along both sides of the loops.

The number of these loops arising during the synaptic rest corresponds to the reduced number of the chromosomes, and the further process in the formation of these chromosomes is simply a thickening and shortening of the loops already formed. When these become divided during the next mitosis they break transversely at a point corresponding to the original bends of the loops, and as the halves thus severed separate, the original longitudinal fission can be clearly traced running along their entire length. It is thus this original fission of the spirem thread, which serves to distribute the halves of the disunited somatic chromosomes during the following homotype division, and the hitherto enigmatical figures described by Flemming Mevès and others in the diaster of the heterotype find their natural explanation.

It would thus appear that the synapsis and the so-called heterotype mitosis constitute a phase which has been specially intercalated in the reproductive cycle. In it the reduction in the number of the chromosomes is produced by their adhesion in pairs, and the completion of the original longitudinal fission of the spirem thread is deferred until the following homotype mitosis.

The authors purposely refrain from discussing the general bearing of these observations, reserving this for a further and more detailed communication.

PARIS.

Academy of Sciences, July 27.—M. Mascart in the chair.—The preparation and properties of a silicide of ruthenium, by MM. Henri **Moissan** and Wilhem **Manchot**. At the melting point of ruthenium this metal combines with silicon with ease, giving a silicide of the formula RuSi, of density 5·40, perfectly crystalline, possessing great hardness, and very stable in the presence of most reagents.—Arsenic in sea-water, in rock-salt, kitchen salt, mineral waters, &c. Its determination in some common reagents, by M. Armand **Gautier**.—On dividing waves, by M. P. **Duhem**.—On cyclohexane and its chlorine derivatives, by MM. Paul **Sabatier** and Alph. **Mailhe**. The authors have shown that the aromatic nucleus really persists in the hydrocarbon; the vapour of cyclohexane directed alone on to recently reduced nickel maintained between 270° and 280° is regularly decomposed, reforming benzene and hydrogen, which at this temperature reacts on the benzene, transforming it into methane, $3C_6H_{12}=2C_6H_6+6CH_4$. The presence of the aromatic nucleus is also proved by the reactions of the chloro-derivatives. One monochlorocyclohexane, two dichloro-, three trichloro-, and one tetrachloro-cyclohexane are described.—Photograph of Borrelly's comet, 1903 *c*, by M. **Quénisset**. The photograph was taken at the Nanterre Observatory on July 24–25, with an exposure of one hour. The photograph shows that the coma measures 16′ in diameter, that is, a little more than half the apparent diameter of the moon. Several tails can be distinguished, the most luminous and longest of which is at least 7° 50′ in length.—On the conditions of synchronisation, by M. **Andrade**.—On the measurement of the dichroism of crystals, by M. Georges **Meslin**.—On the electrical dichroism of liquids containing crystalline particles in suspension, by M. J. **Chaudier**. With the advice of M. Meslin, who has examined the modifications produced in ordinary light by its passage through a liquid containing crystalline particles and placed first in a magnetic field and secondly in an electric field, the author has continued the experiments with other mixtures in an electric field. A certain number of the mixtures presented a decided dichroism, which took a certain time to appear and disappear after the discontinuance of the field. The liquids which entered into the composition of the active mixtures usually contained no oxygen. No direct relation seems to exist between the chemical properties of the solid and the electrical dichroism it is able to cause when associated with a suitable liquid.—On the separation of gaseous mixtures by centrifugal force, by MM. G. **Claude** and E. **Demoussy**.—On the laws and the equations of chemical equilibrium, by M. **Aries**.—On a combination of two bodies which unite as a result of an elevation of temperature then separate below −79°, by M. D. **Gernez**.—Separation and simultaneous determination of baryta, strontia, and lime, by M. Lucien **Robin**.—On the condensation of ethers with alcohols, by M. Ch. **Moureu**.—On the composition of allyl cyanurate, by M. R. **Lespieau**.—Contribution to the study of the quinones-diketones, by M. **Œchsner de Coninck**.—Albuminoid substances in Indian corn, by MM. **Donard** and **Labbé**.—The use of a calorimetric bomb to demonstrate the presence of arsenic in the organism, by M. Gabriel **Bertrand**. With camphor or pure sugar no trace of arsenic was obtained, but a few grams of tortoise-shell, of sponge, of the white or yolk of an egg, gave clear indications of arsenic.—Influence of temperature on the production of sulphuretted hydrogen by albuminoid substances, extracts of animal organs and extracts of yeast, in the presence of sulphur, by MM. J. E. **Abelous** and H. **Ribaut**.—Researches on the natural immunity of vipers and snakes, by M. C. **Phisalix**.—On the spermatogenesis of decapod crustaceans, by M. Alphonse **Labbé**.—Artificial production of gigantic larvæ in an Echinoid, by M. F. A. **Janssens**.—Inscription of the variable state of the tension of the wire of the ergograph: equation of the movement and expression for the work, by MM. A. **Imbert** and J. **Gagnière**.—On the production of gum in tissues, by M. G. **Delacroix**.—On the trenchings of the plain of Sevran, by M. Gustave F. **Dollfus**.—On a new physical method of research and of the determination of the watering of wines, by M. Georges **Maneuvrier**.

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